

FIG. 1

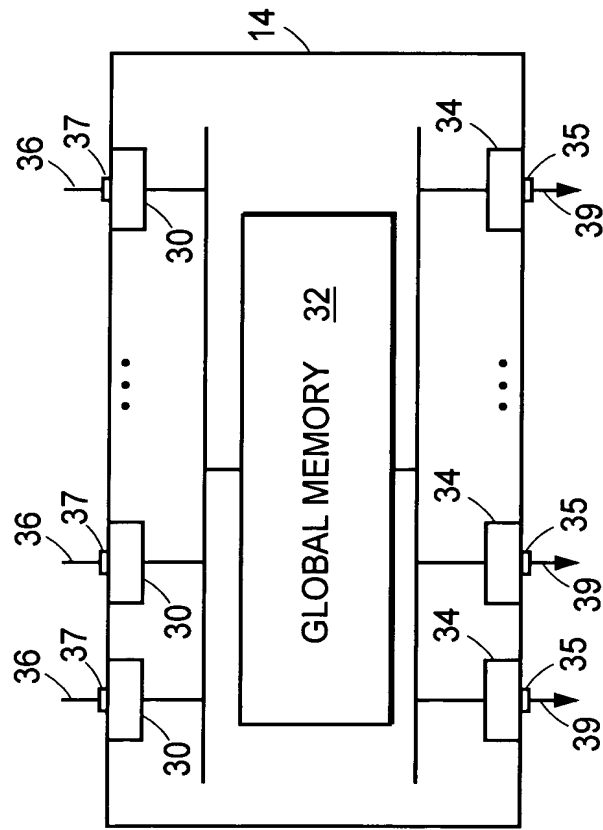


FIG. 2

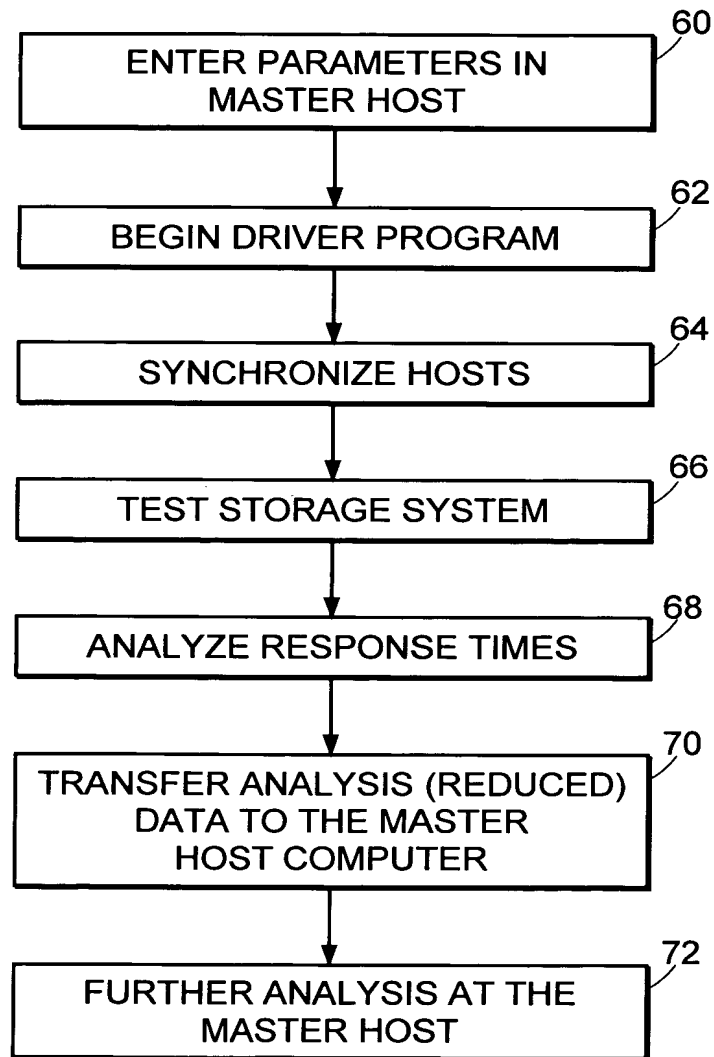


FIG. 3

FIG. 4A
FIG. 4B

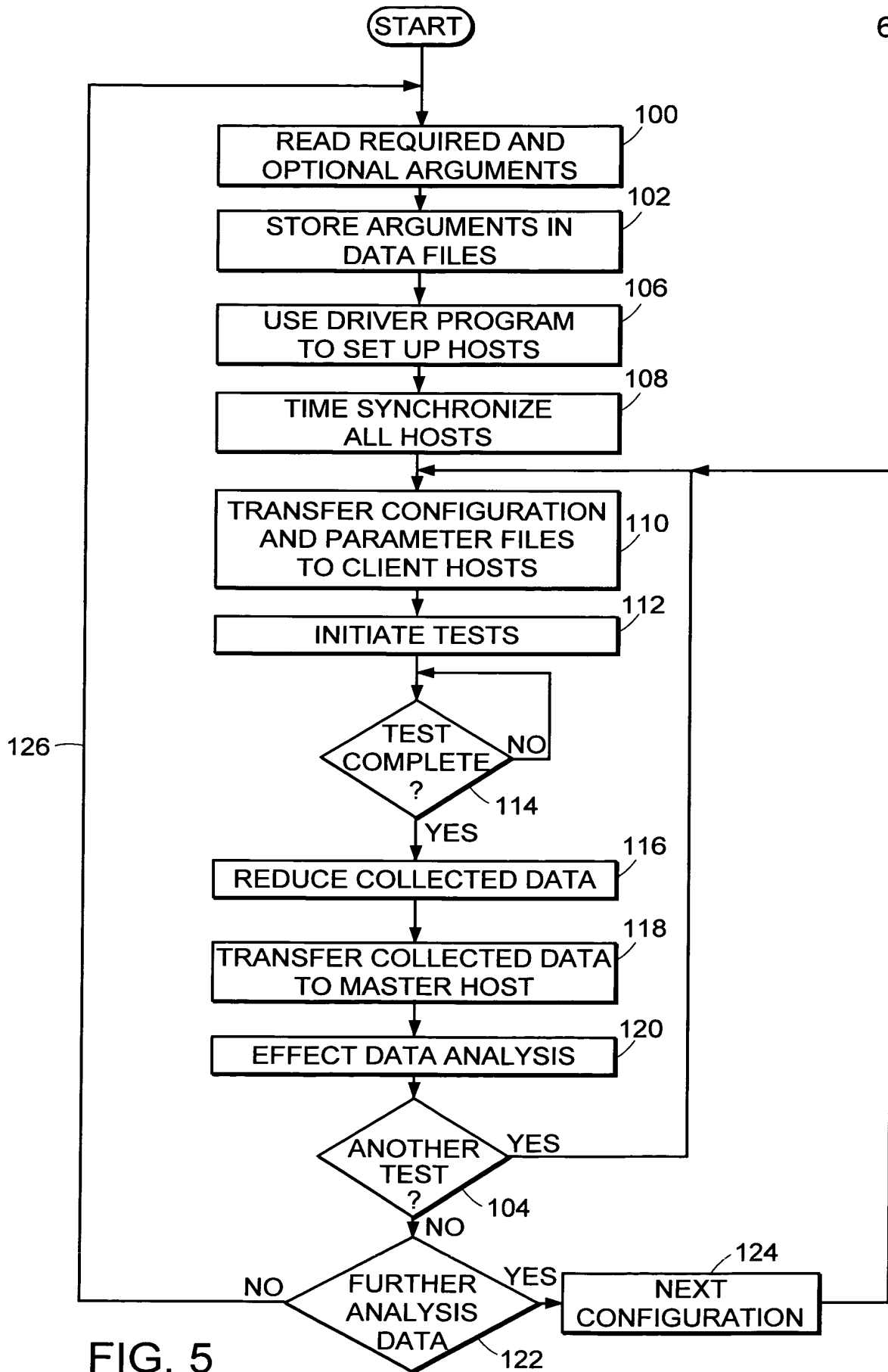
FIG. 4

REQUIRED	NUMBER OF LOGICAL DISKS
	NUMBER OF "CHILD" PROCESSES TO START
	NUMBER OF CAPTURE RESPONSE TIMES
	NUMBER OF RESPONSE TIMES
	BUFFER SIZE
	OFFSET SIZE
	MAXIMUM RANGE
	TIME OF TEST
	READ/WRITE SIZE
	READ/WRITE MIX

FIG. 4A

OPTIONAL	ID OF DEVICES BEING TESTED
	ID OF MASTER & CLIENT HOSTS
	I/O TYPE (SEQUENTIAL OR RANDOM)
	NUMBER OF I/O OPERATIONS PERFORMED TO CORRECT OFFSET
	DISPLACEMENT FROM OFFSET
	DELAY BETWEEN COMMANDS
	INITIAL BYTE OFFSET
	NUMBER OF SEEKS FOR RANDOM I/O
	DATA REDUCTION METHOD
	ICDA PERCENT HIT RATE

FIG. 4B



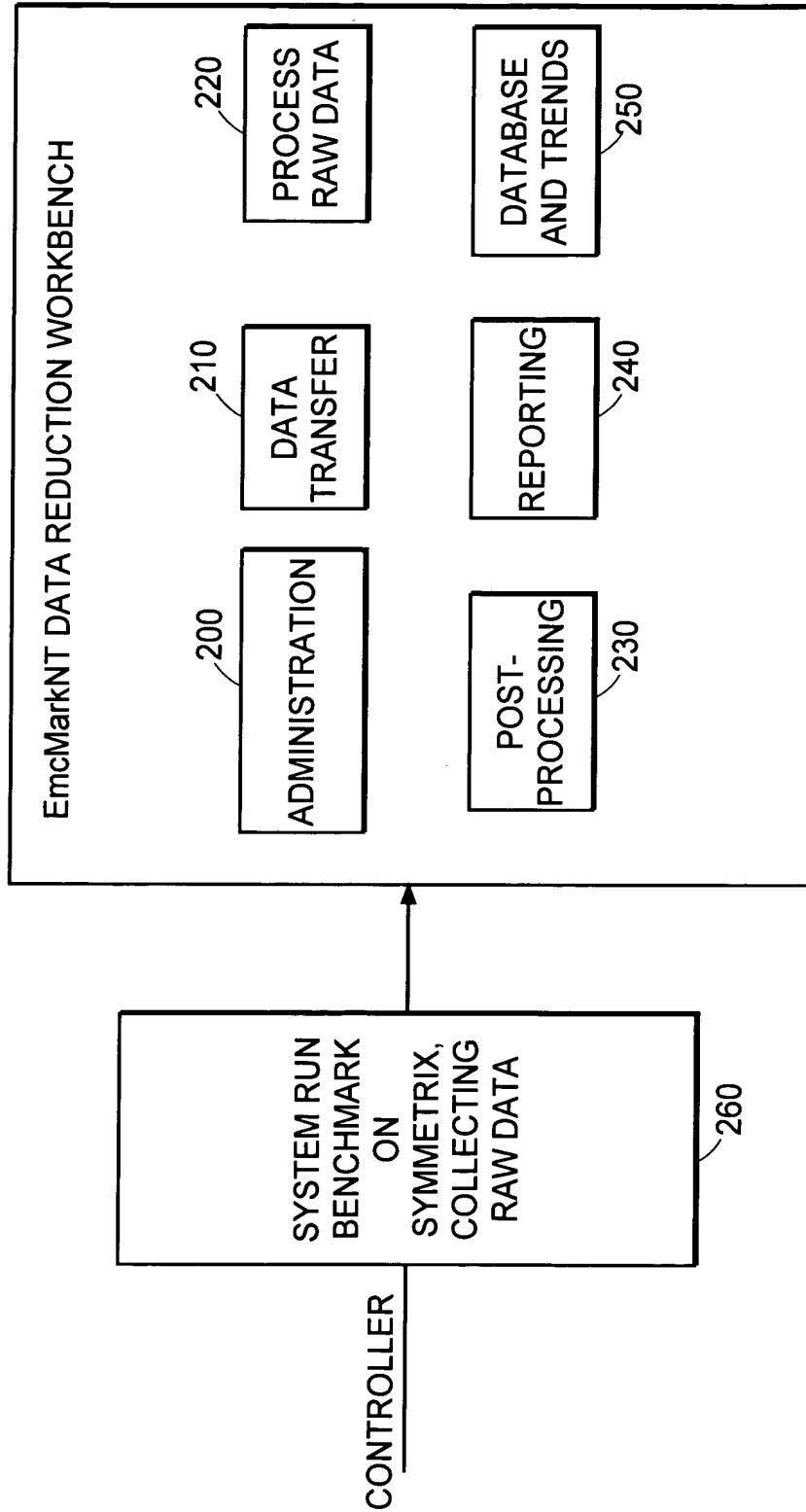


FIG. 6

# EmcMarkNT DATA REDUCTION WORKBENCH FLOW

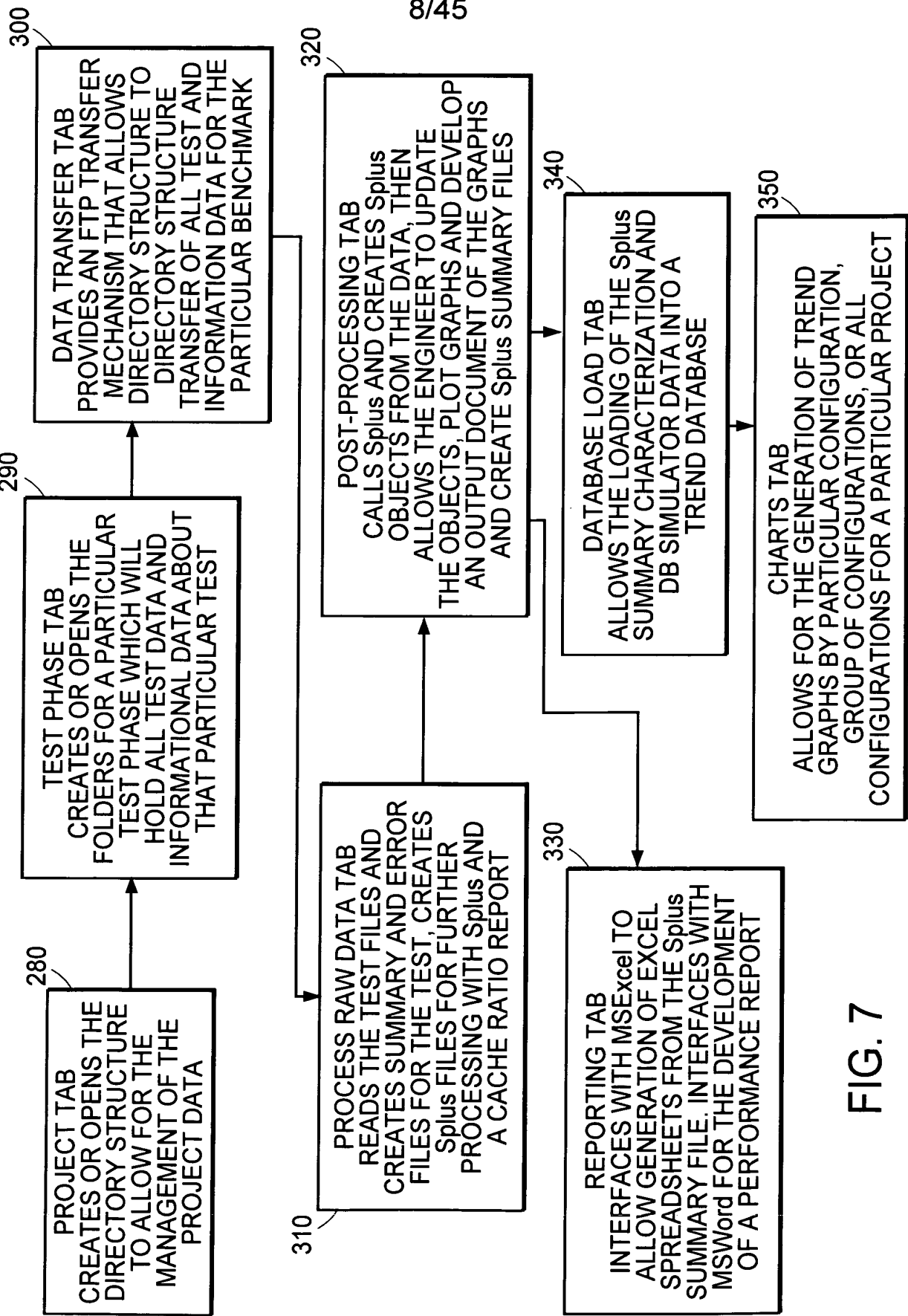
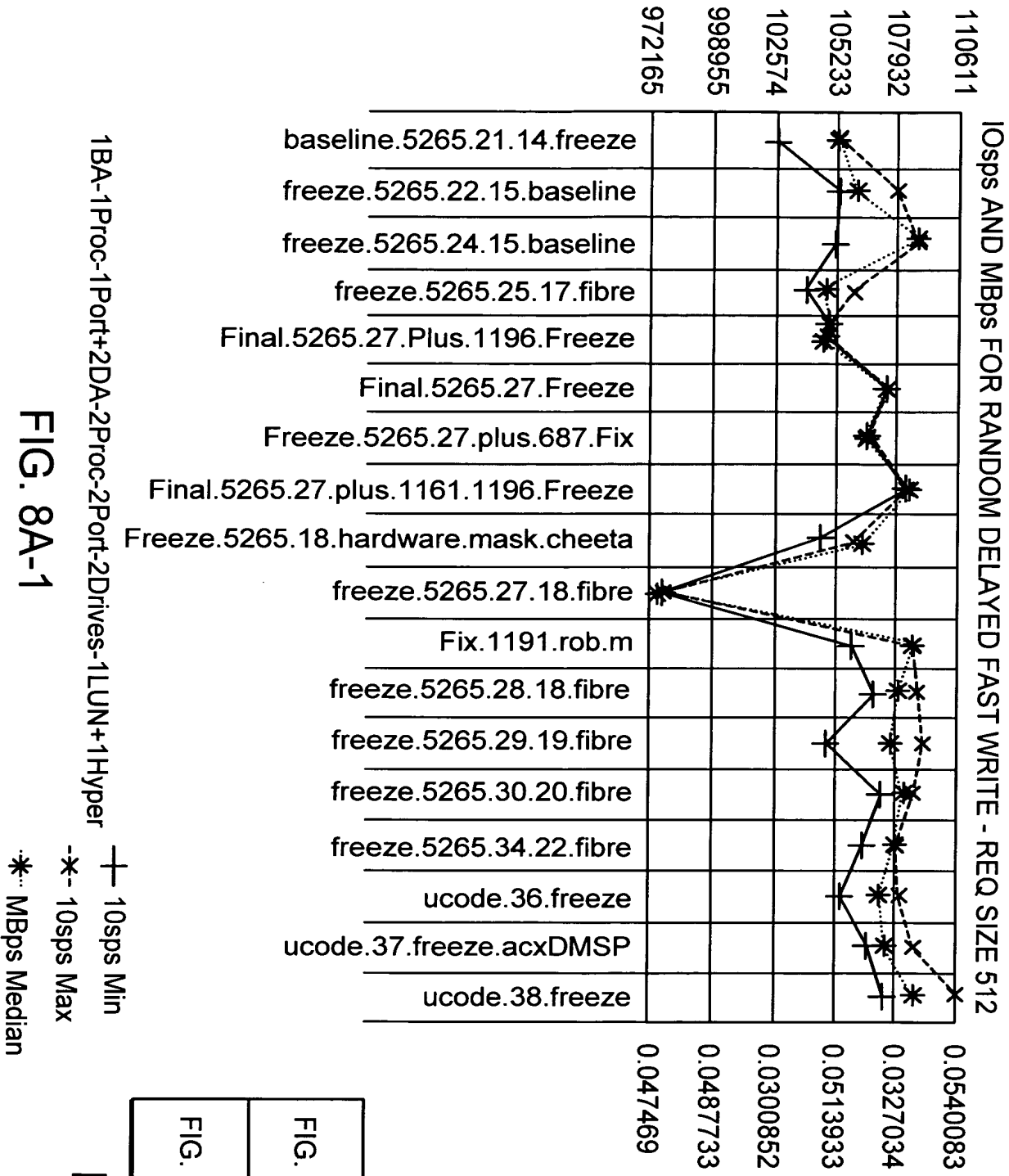


FIG. 7





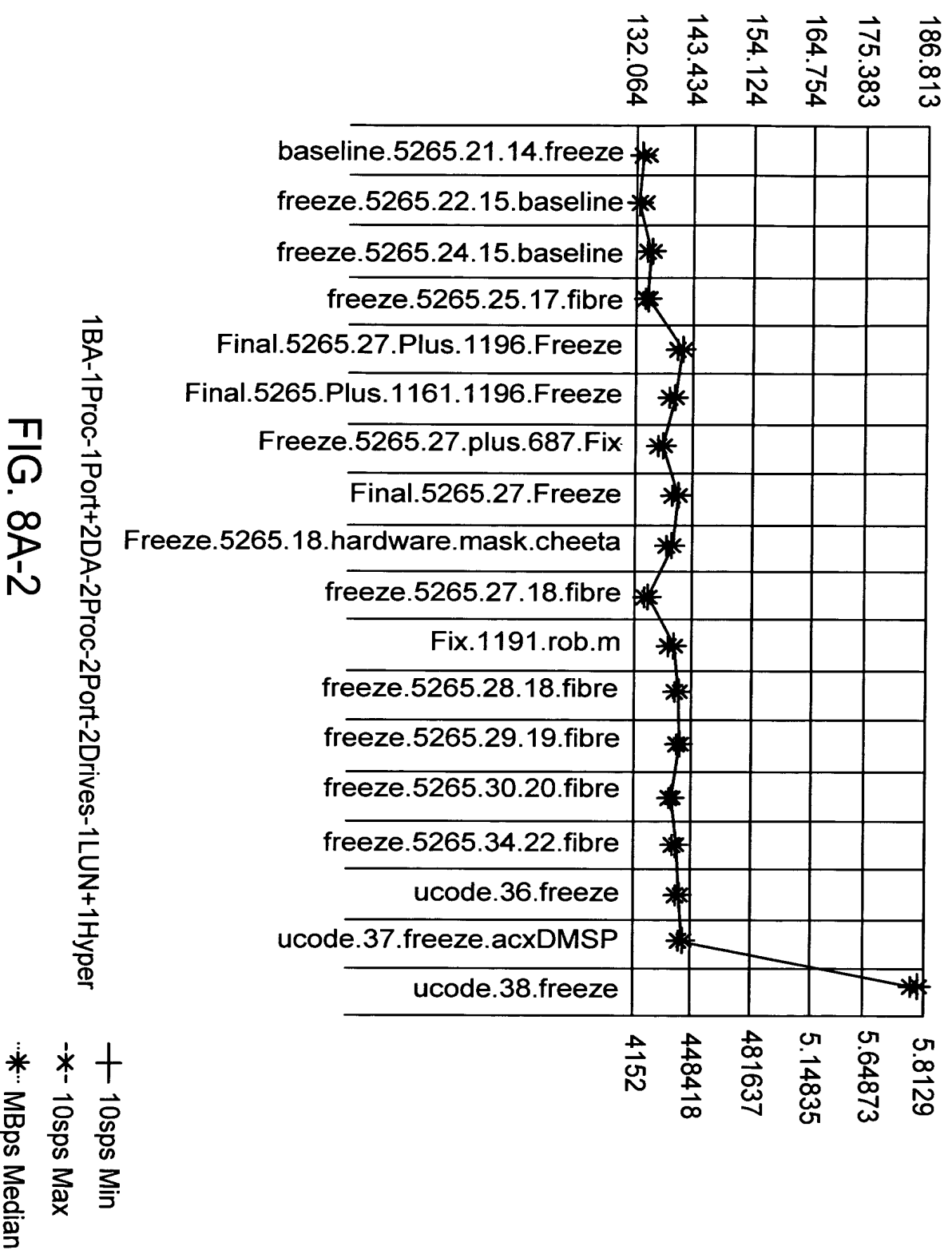
1BA-1Proc-1Port+2DA-2Proc-2Port-2Drives-1LUN+1Hyper

FIG. 8A-1

FIG. 8A-1	FIG. 8A-2
FIG. 8A-3	FIG. 8A-4

FIG. 8A

IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 32768



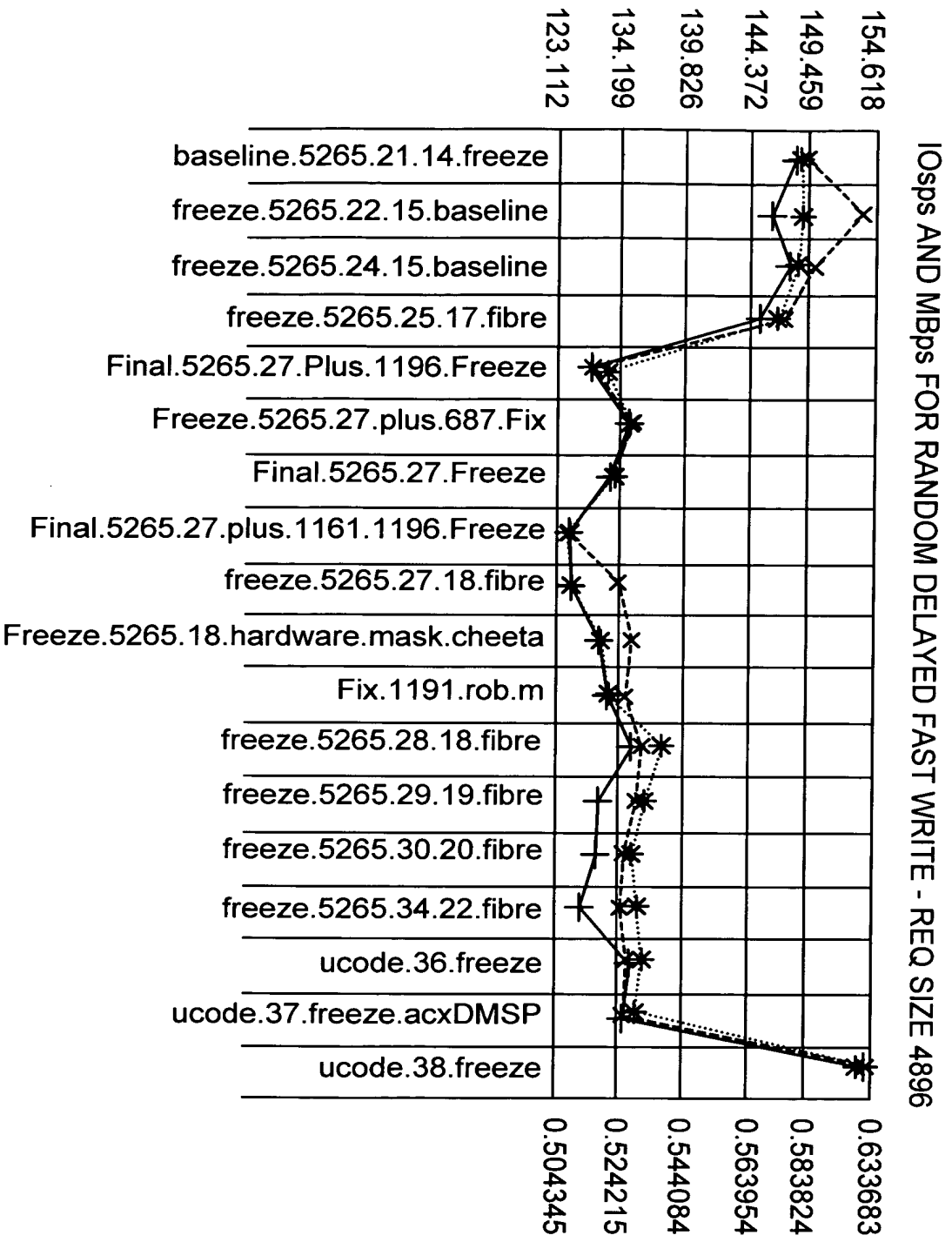


FIG. 8A-3

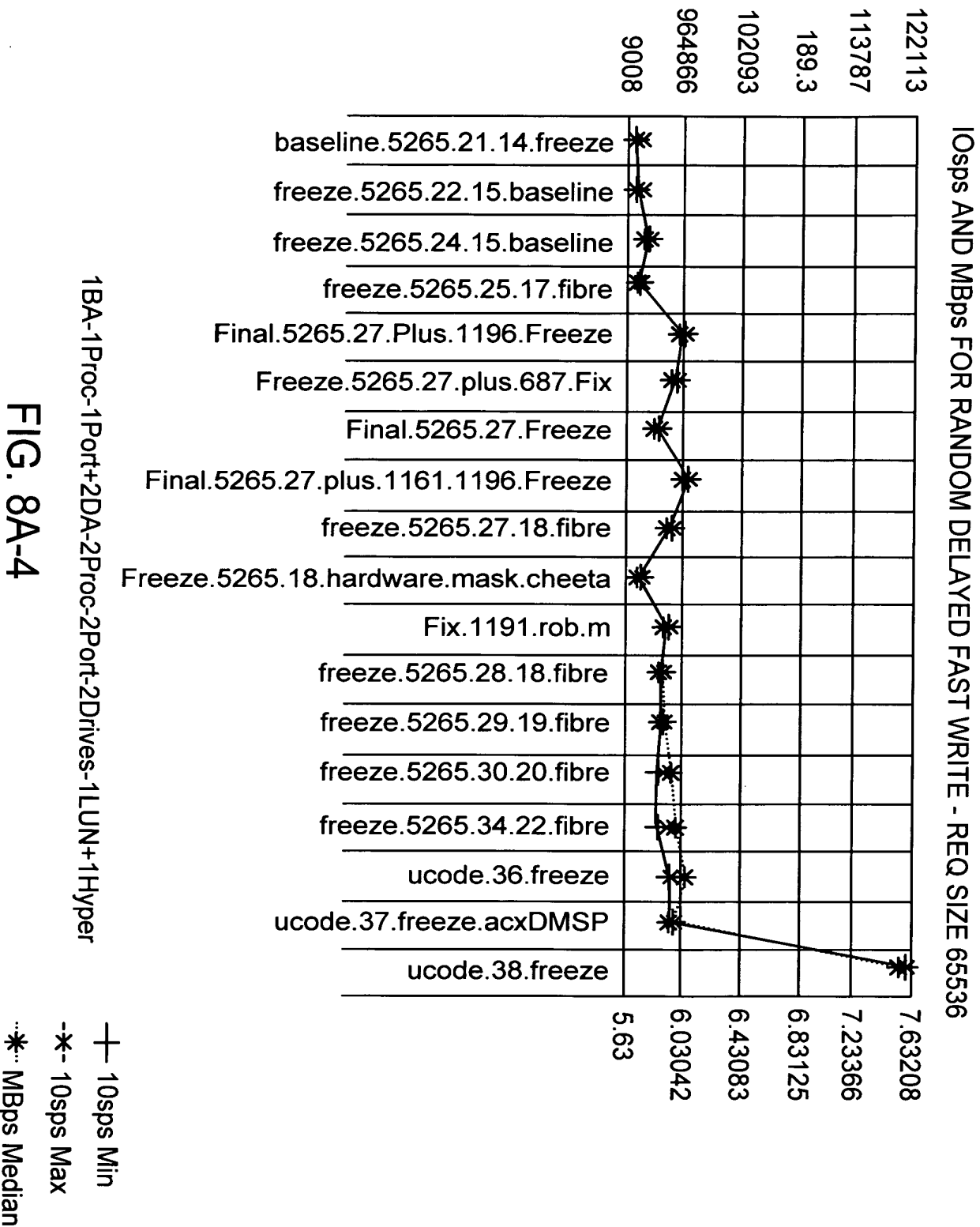


FIG. 8A-4

IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512

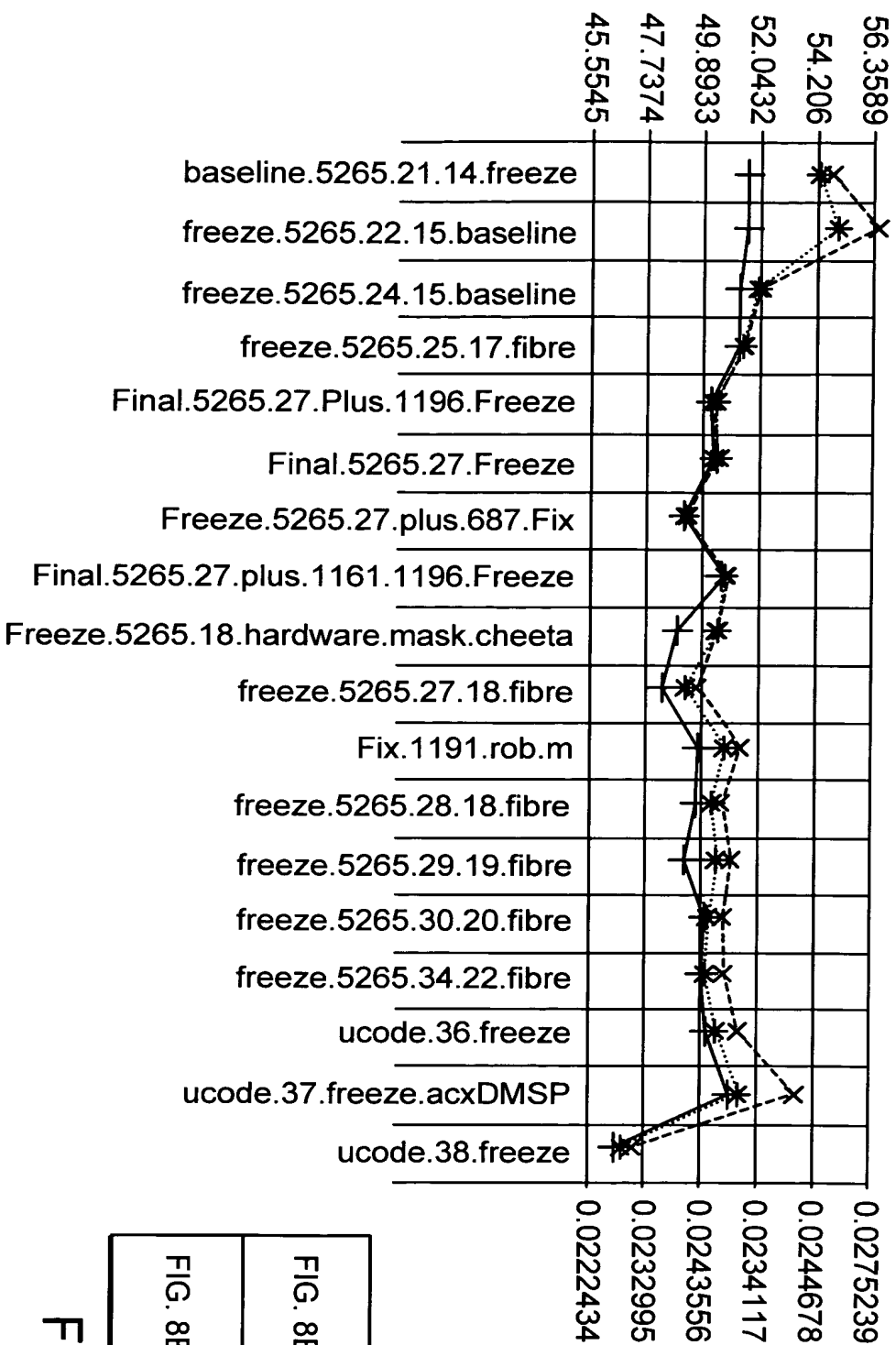


FIG. 8B-1	FIG. 8B-2
FIG. 8B-3	FIG. 8B-4

FIG. 8B

BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

FIG. 8B-1

+ 10sps Min  
 - \* - 10sps Max  
 . . \* . MBps Median

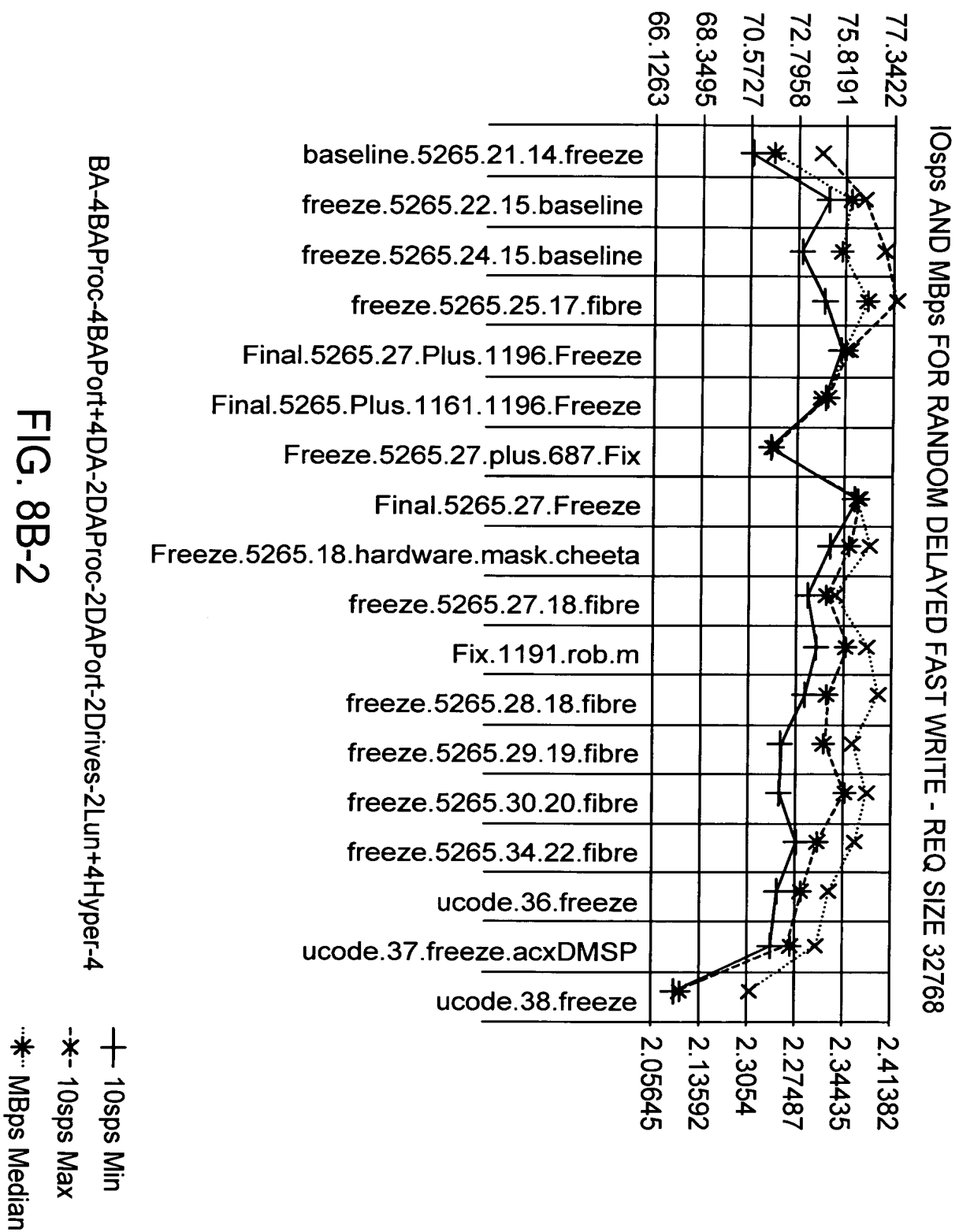
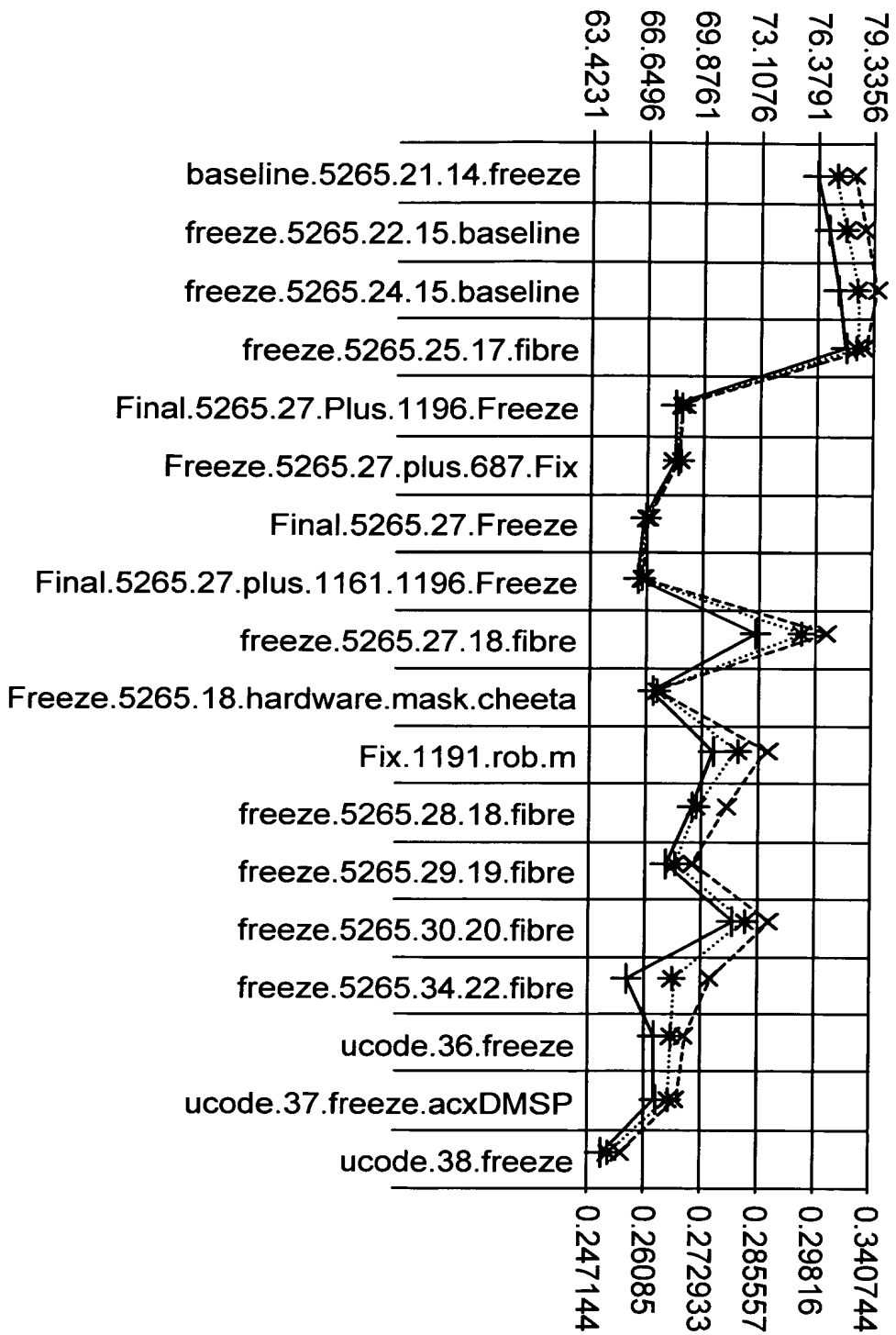


FIG. 8B-2

BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

# IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4096

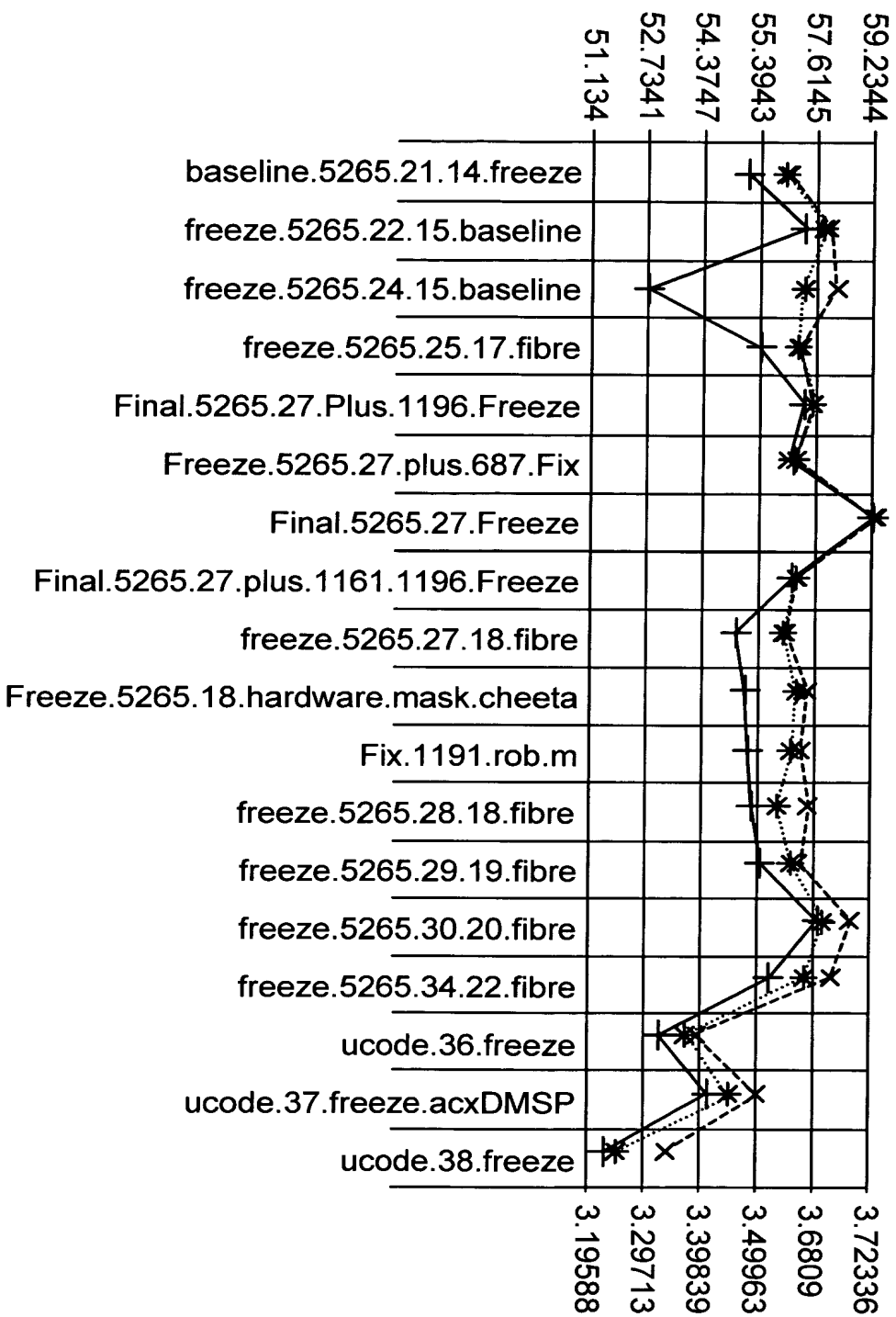


BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

FIG. 8B-3

+ 10sps Min  
 -x- 10sps Max  
 ...\* MBps Median

# IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 65536

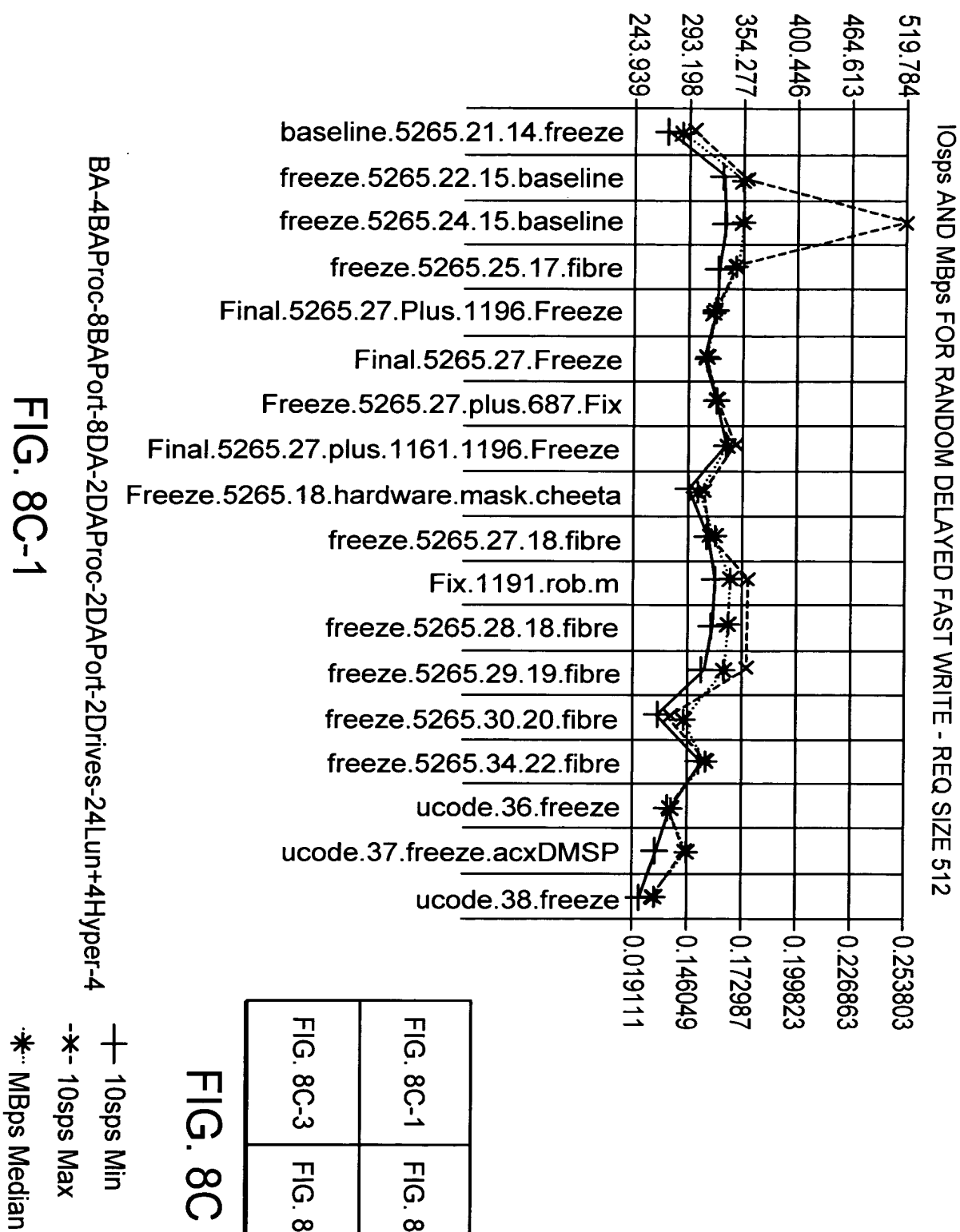


BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

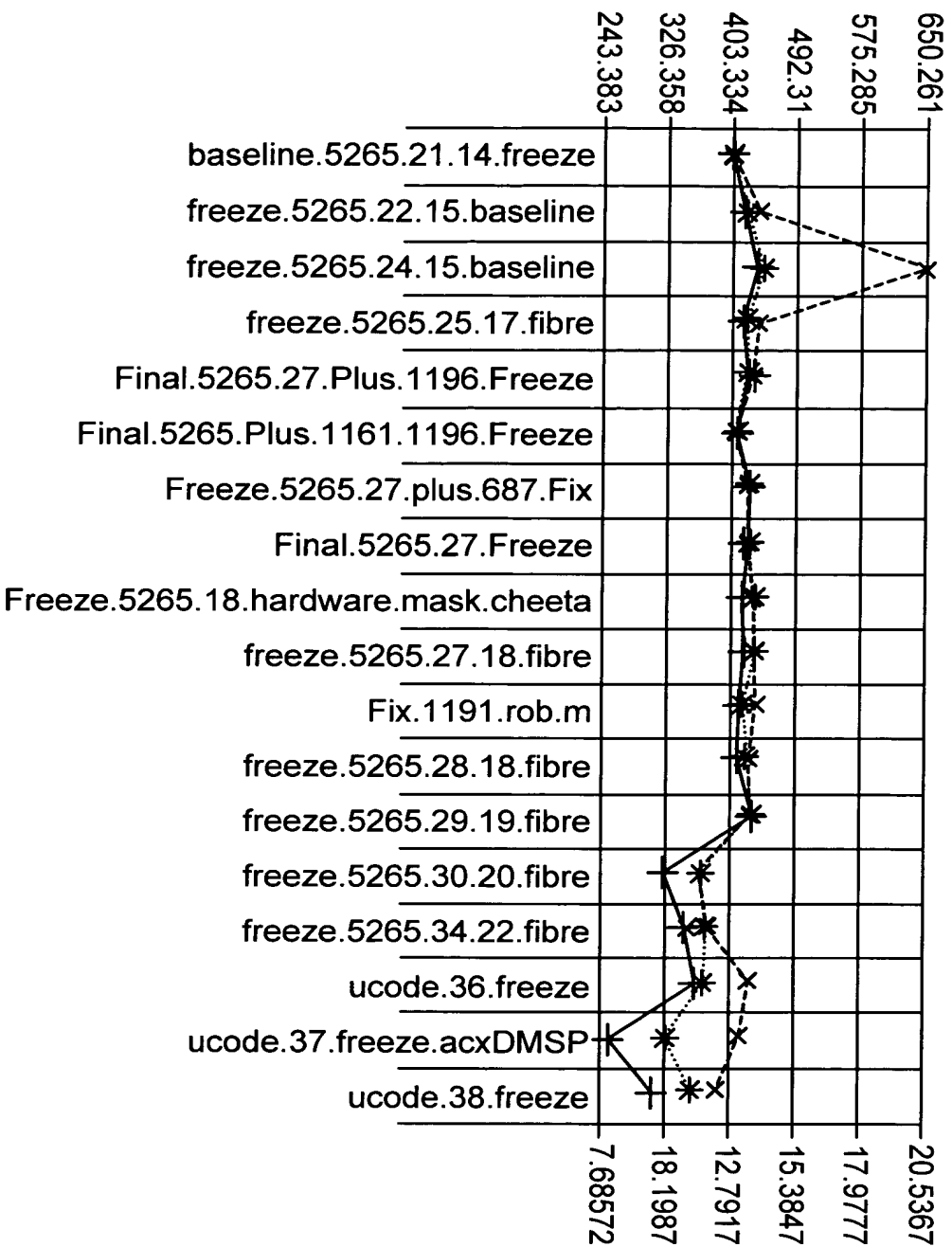
**FIG. 8B-4**

+ 10sps Min  
-\* 10sps Max  
... MBps Median





# IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 32768

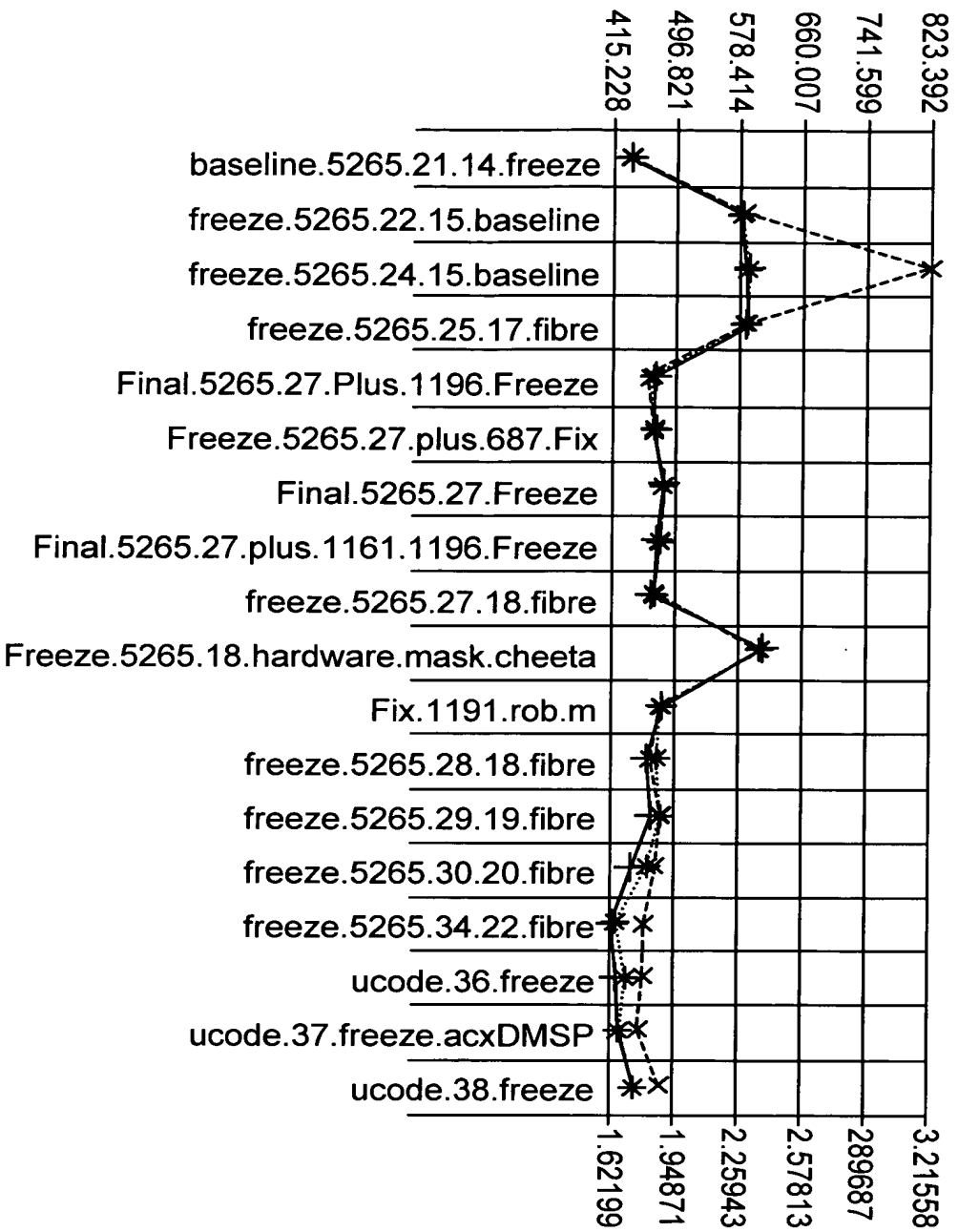


BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Dives-24Lun+4Hyper-4

**FIG. 8C-2**

+ 10sps Min  
 - \* - 10sps Max  
 . \* . MBps Median

# IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4896

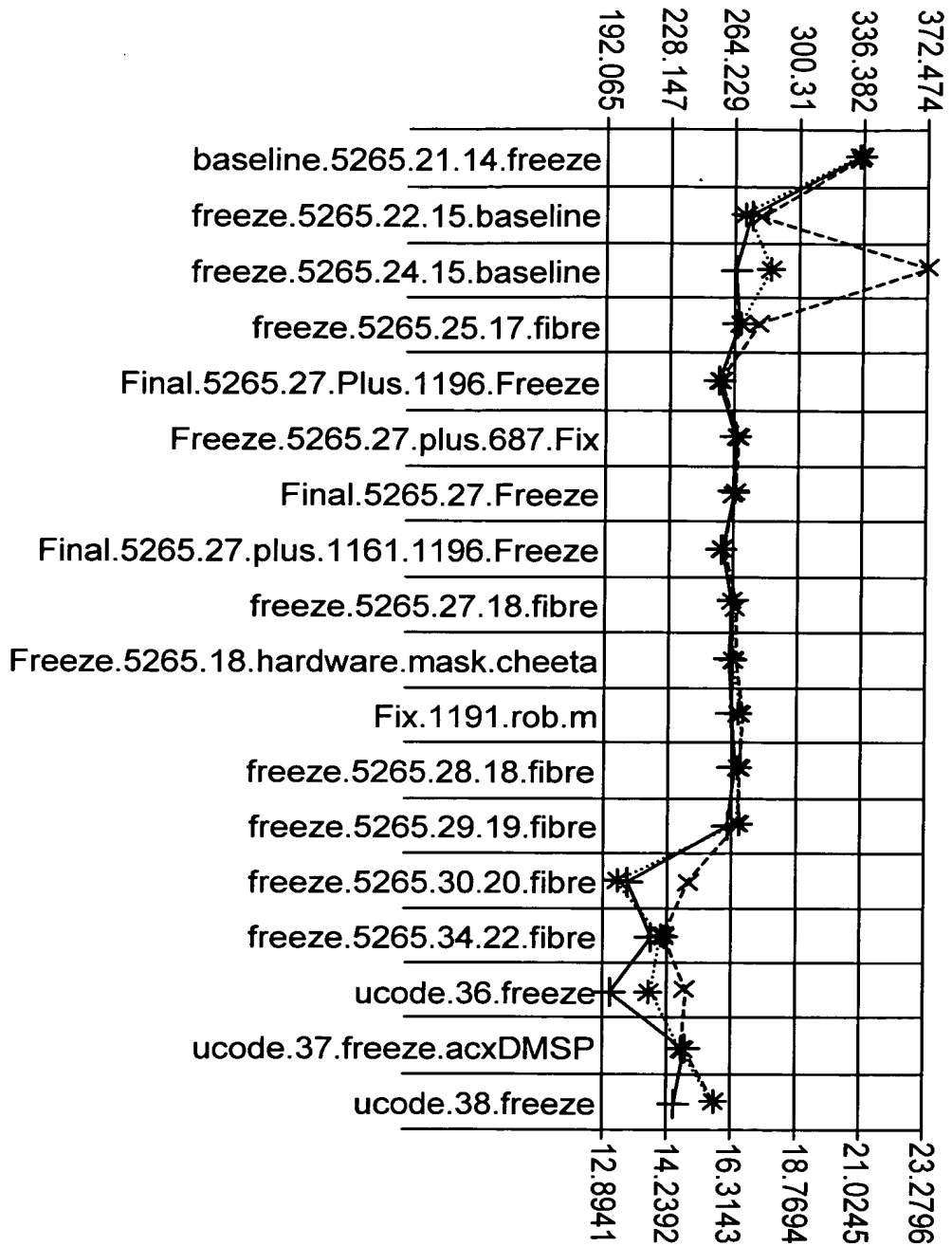


BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Dives-24Lun+4Hyper-4

FIG. 8C-3

+ 10sps Min  
 -x- 10sps Max  
 ...\* MBps Median

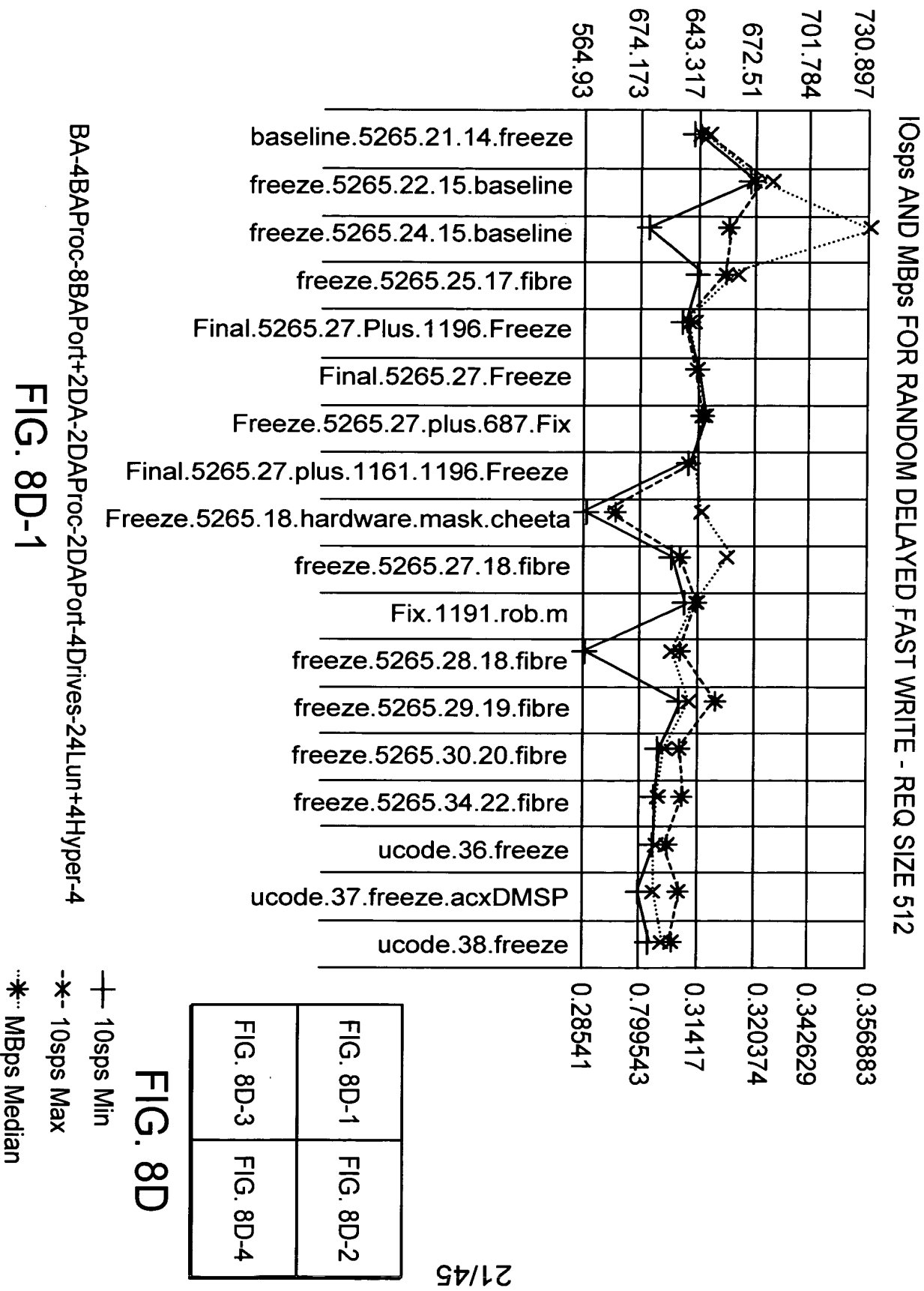
# IOSps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 65536

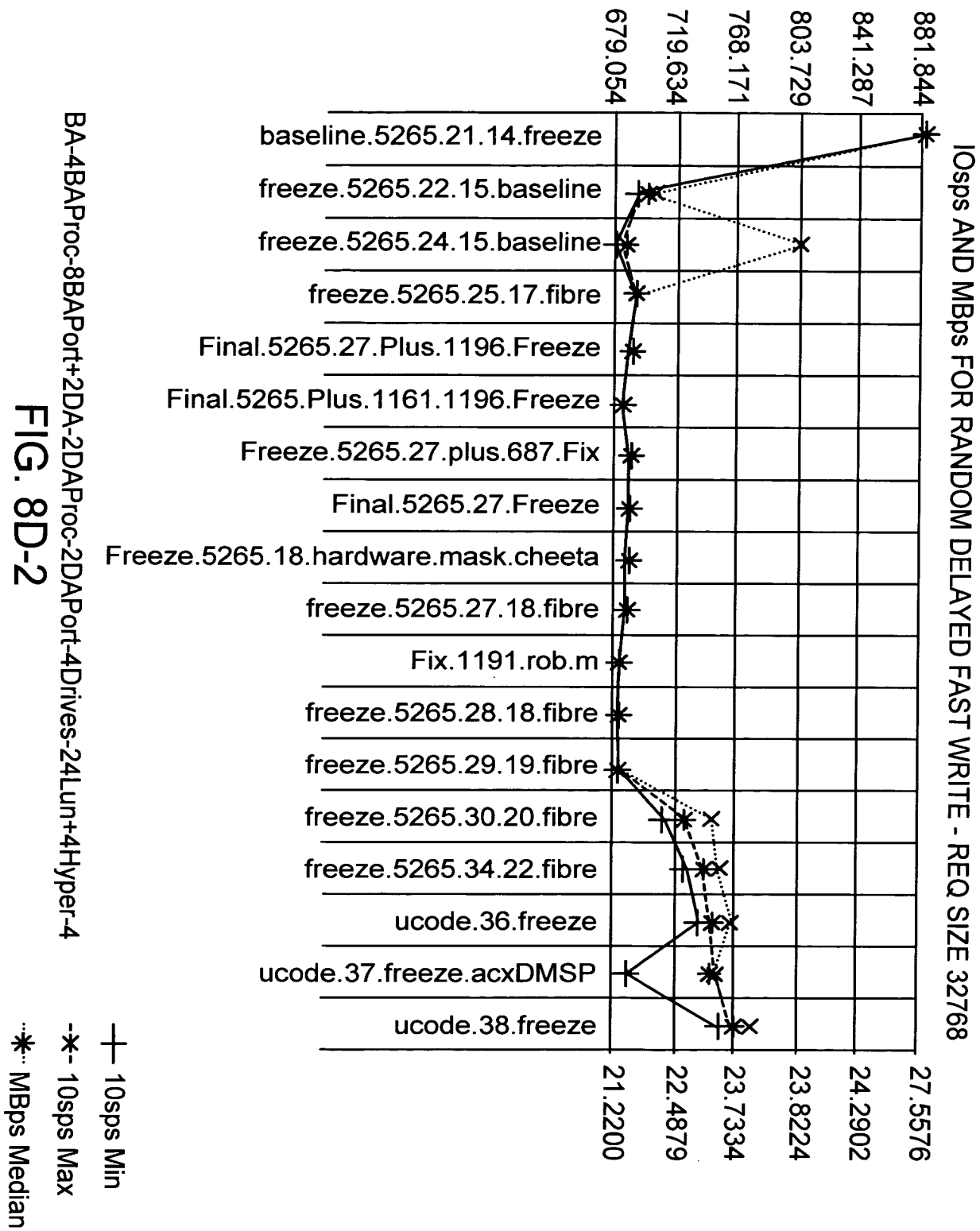


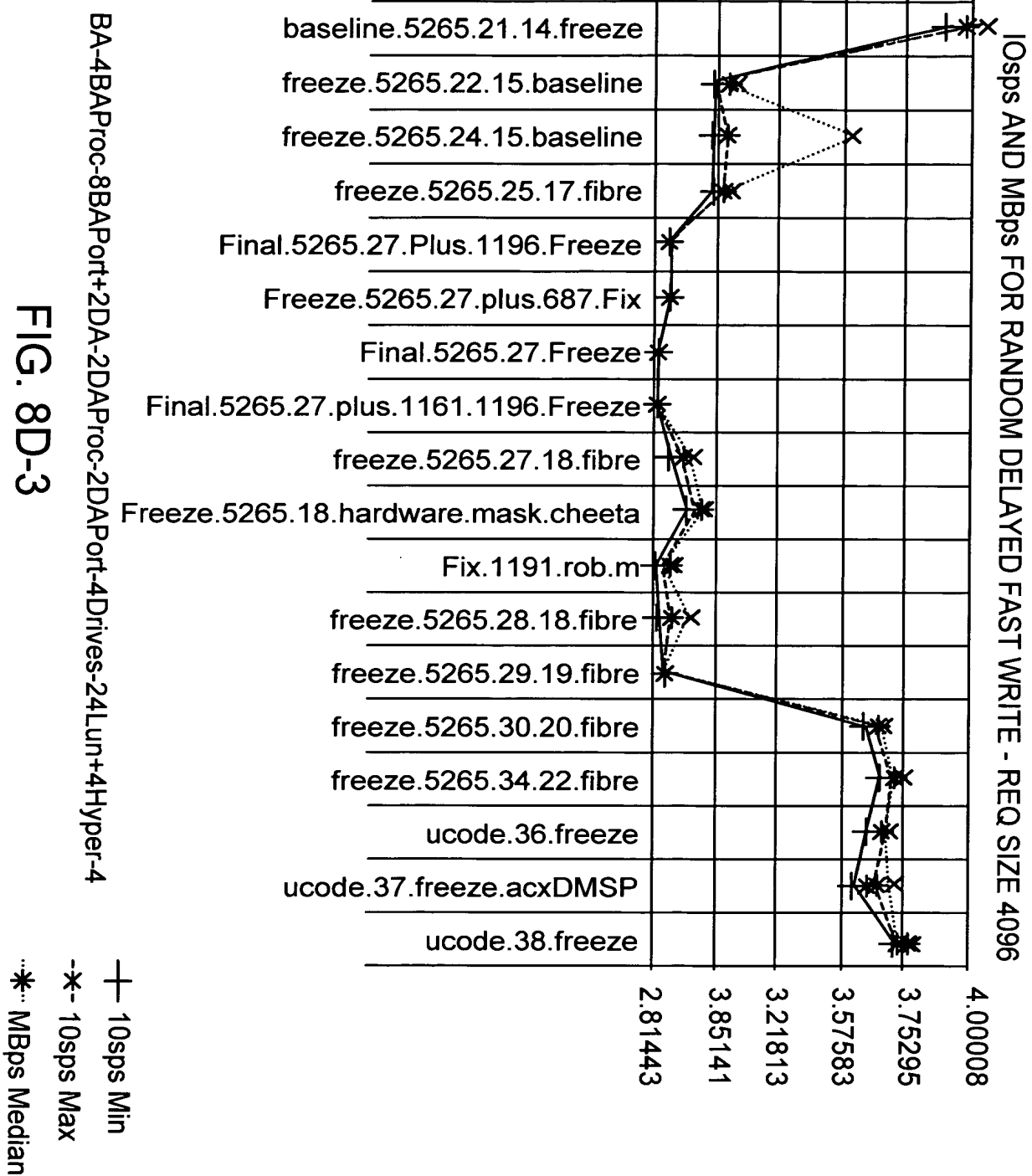
BA-4BAProc-8BAPort-8DA-2DAPProc-2DAPort-2Drives-24Lun+4Hyper-4

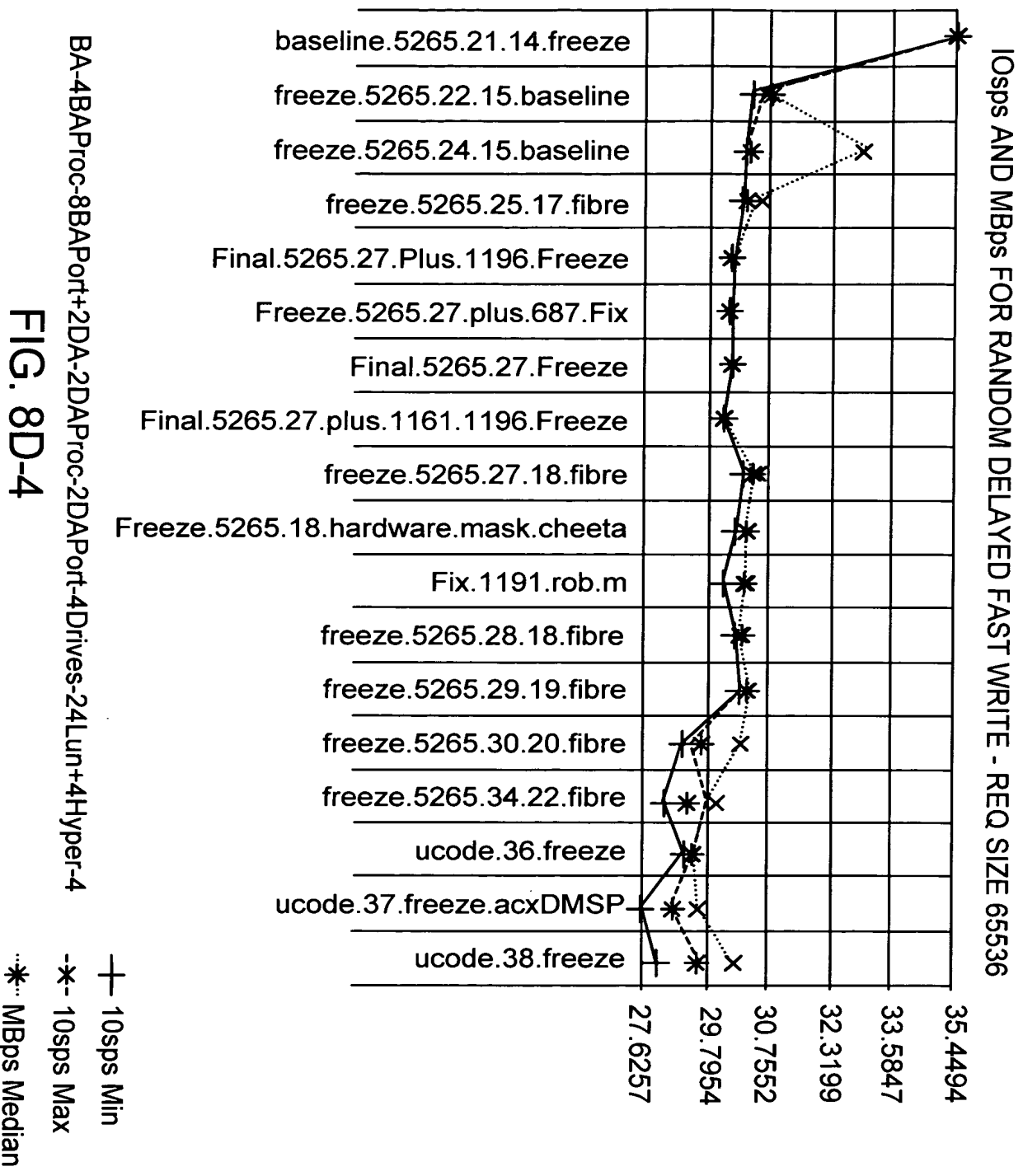
FIG. 8C-4

+ 10sps Min  
 -x- 10sps Max  
 ...\* MBps Median











POST PROCESSING TAB  
THE POST PROCESSING TAB CREATES OBJECTS, PLOT GRAPHS AND GENERATES SUMMARY  
FILES USING THE Splus DATA ANALYSIS SOFTWARE.

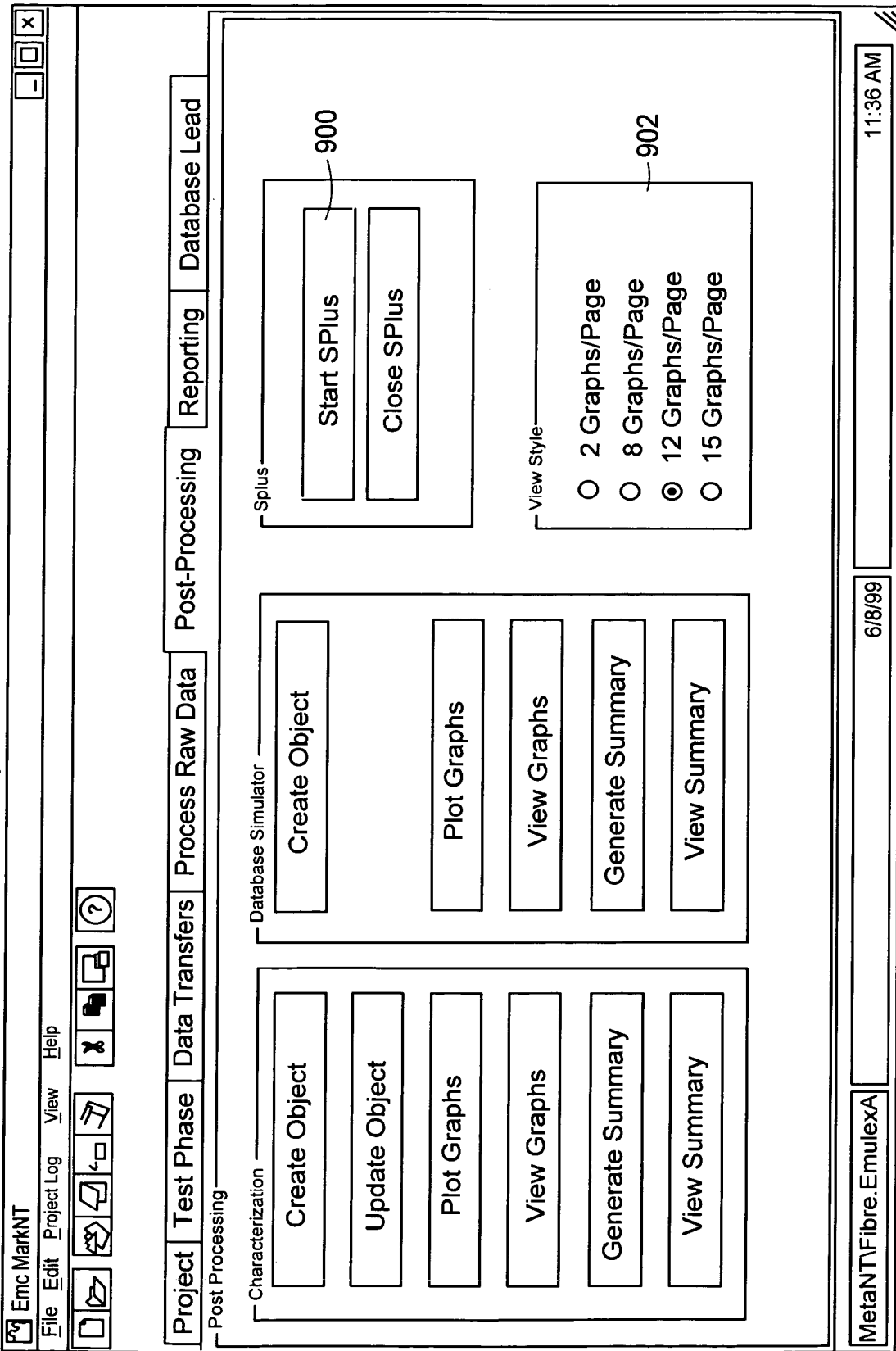


FIG. 9

SYMMETRIX CONFIGURATION VIEW

Emc MarkNT Performance Characterization W

File Actions View Help

Symmetrix Configuration

Physical Device Symmetrix Device

CPQ01 000183500055

CPQ02 000183500055

Hostname CPQ01

Add Remove Refresh

Emc MarkNT Performance Characterization W

File Actions View Help

Symmetrix Configuration

Physical Device Symmetrix Device

CPQ02 000183500055

FA-1A DA-2A DA-3A FA-5A FA-12A DA-14A DA-15A SA-16A FA-1B DA-2B DA-3B FA-5B FA-12B

Hostname CPQ01

Add Remove Refresh

Emc MarkNT Performance Characterization W

File Actions View Help

Symmetrix Configuration

Physical Device Symmetrix Device

DA-2B DA-3B FA-5B FA-12B DA-14B DA-15B SA-16B

IPHYSCALDR

Hostname CPQ01

Add Remove Refresh

FIG. 9A

# DEVICE DETAIL

Device Details			
Symmetrix			
Vendor Id:	EMC		
Product Id:	SYMMETRIX		
Symmetrix Id:	000183500055		
Director:	SA-16B		
Port Number:	1		
TID:	0		
LUN:	0		
Hyper Count:	2		
Device Detail			
Symmetrix Device:	000		
Block Size:	512		
Physical Device:	\\.\PHYSICALDRIVE0		
Capacity:	7741440		
Logical Device:			
Cylinders:	8064		
Serial Number:	55000321		
Emulation:	FBA		
Device Status:	Ready		
Mirror Policy:	two-way mirror		
Flags			
<input type="checkbox"/> CKD	<input checked="" type="checkbox"/> META Head	<input type="checkbox"/> PowerPath Parent	<input type="checkbox"/> RDF
<input type="checkbox"/> ASSOC	<input type="checkbox"/> META Member	<input type="checkbox"/> PowerPath Child	<input type="checkbox"/> BCS
<input type="checkbox"/> VCM	<input type="checkbox"/> Gatekeeper	<input type="checkbox"/> PowerPath Sibling	<input type="checkbox"/> BCV
<input type="checkbox"/> Mixed	<input type="checkbox"/> Multichannel	<input type="checkbox"/> No channel	<input checked="" type="checkbox"/> META
OK			

FIG. 9B

SYMMETRIX DETAILS

Director Details

Symmetrix

Director:

FA-1A

Director Type:

Fibre Adapter

Director Num:

1

Slot Num:

1

SCIS Width:

N/A

Num Ports:

1

Port 0 status:

On

Port 1 status:

N/A

Port 2 status:

N/A

Port 3 status:

N/A

OK

FIG. 9C

FIG. 9D

## ENVIRONMENT TAB

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device    ☐ Symmetrix Device

cpq01

000183500055

Hostname: cpq01

Add Remove Refresh

Definition Environment Workload Configuration Benchmark Results

Environment

Master Host Directories

Tools Directory: /bench/EMCtools

Work Directory: /bench/work

Gateway:

Flags

DMSF

☒ Auto    ☐ On    ☐ Off    ☐ Ignore

☒ Flush Cache    ☒ IMPL Reset (\$FDCE)

Trace

☒ Ignore    ☐ Stop    ☐ Clear    ☐ CKD

Defaults

Maximum Block Size 128 k

Block Sizes

☒ 512    ☐ 1024    ☐ 2048    ☐ 4096    ☐ 8192    ☐ 16384

FIG. 9E

FIG. 9F

Workload Execution

Workloads

OLTP1

Iterations:

1

Dry

Run

Configuration Rule

1BA-1Port/Proc

OK

Cancel

FIG. 9G



RESPONSE TIME WORKLOAD

Testoltp1

Delay

1

Cache Slots

15

Max I/O Second

Auto

Bucket Size

30

Max Test Period

2:10

Min Test Period

0

Segment 1

1

Segment 2

3

Multiplier

1

LSeeks

0

Start Byte

0

Disk Extent

0

OK

Cancel

Response Time

Throughput

Max Sequential Count

50

Min Sequential Count

50

Workload Transaction Definition

Size	%Workload	%Hits	%Random	%Read	Align	Align Back
OMB 4KB 0B	50	0	100	100	OMB 5KB 0B	OMB 0KB
OMB 4KB 0B	30	0	100	0	OMB 3KB 0B	OMB 0KB
OMB 4KB 0B	10	0	0	100	OMB 5KB 0B	OMB 0KB
OMB 4KB 0B	10	0	0	0	OMB 3KB 0B	OMB 0KB

Request Size

0

4

MBytes

KBytes

Bytes

Alignment

0

5

MBytes

KBytes

Bytes

Back Alignment

0

MBytes

KBytes

Bytes

Insert

Remove

% of Workload

50

% Cache Miss/Hit

0

% Sequential/Random

100

% Write/Read

0

FIG. 9H

# THROUGHPUT WORKLOAD

☒ View Workload

Workload Description

random\_100read

Delay

1.0

Cache Slots

0

SPlus Type

RT Size

20000

Duration Time

30

Unfrictd

0

RT Multiplier

4

I/O Loops

0

Multiplier

4

LSeeks

0

Start Byte

0

Random Range

0

Collect Response Times

☒

Report Individual Response Times

☐

Response Time

☐

Throughput

☒

OK

Cancel

Workload Transaction Definition

Size	% Workload	% Hits	% Random	% Read	Align	Align Back
0 MB 0KB 0B	100	0	100	100	0 MB 0KB 0B	0 MB 0KB

Request Size

0 MB 0KB 0B

Alignment

0 MB 0KB 0B

Back Alignment

0 MB 0KB 0B

Insert

Remove

% of Workload

100

% Cache Miss/Hit

100 0

% Sequential/Random

0 100

% Write/Read

0 100



Configuration Definition

Rule Name

OK

Cancel

Rule Definition

F/E Expression

~Expression not yet Defined

F/E Expression

B/E Expression

Front-End

☒ FA-01:a:0

☒ SA-16:a:0

☒ FA-05:a:0

☒ SA-16:a:1

☒ FA-12:a:0

☒ FA-01:a:0

AllNone

Back-End

☒ DA-02:a:C

☒ DA-15:a:C

☒ DA-03:a:C

☒ DA-02:a:C

☒ DA-14:a:C

☒ DA-03:a:C

AllNone

Expressions

Build

Update

Max I/O Second

Auto

Mirrors

☒ M1

☐ M2

AllNone

TIDs

☒ 0

☐ 1

AllNone

LUNs

☒ 0

☒ 1

☒ 2

☒ 3

AllNone

FIG. 9K

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device

☐ Symmetrix Device

cpq01

000183500055

Hostname

cpq01

Add

Remove

Refresh

Definition

Environment

Workload

Configuration

Benchmark

Results

Benchmark Definition

Benchmark Execution List

Profiling

Regression

View

New

Edit

Copy

Delete

Start

<< Add

Remove >>

☒ ALL

☐ User

☐ Std

FIG. 9L

Benchmark Execution

Benchmark

Regression

Iterations: 3 

▼

☐ Dry Run

OK

Cancel

FIG. 9M

View Benchmark

Benchmark Name

Regression

OK

Cancel

Benchmark Workload Definition

Workload	Configuration Rule	Delay Milliseconds	CacheSlots	MaxIOPs
RRM	1Hyper	-1	-1	
RRM	Everything	-1	-1	
OLTP1	Everything	-1	-1	
OLTP2	3Hypers/4Drives	-1	-1	
OLTP3	1Hyper/2Drives	-1	-1	
DSS1	1Hyper	-1	-1	
DSS2	Everything	-1	-1	
TERADATA	2Drives/DA-3Hyper/4Drives	-1	-1	

Delay

0

Cache Slots

0

Max I/O Second

0

Bucket Size

0

Max Sequential Count

50

Max Test Period

0

Min Test Period

0

Segment 1

0

Segment 2

0

Min Sequential Count

50

Multiplier

0

LSeeks

0

Start Byte

0

Disk Extent

0

Workload

RRM

Configuration Rule

1 Hyper

Insert

Remove

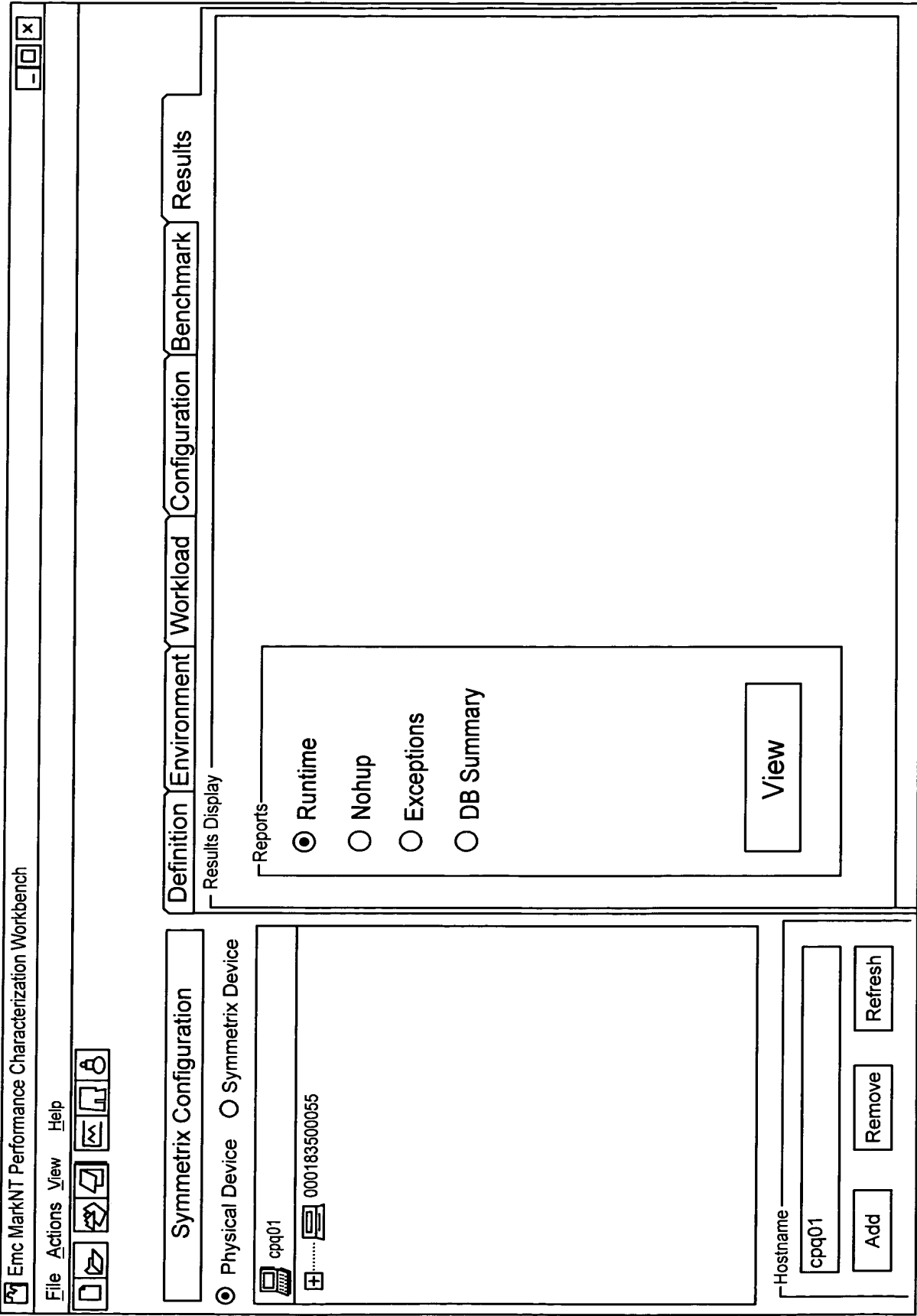


FIG. 90



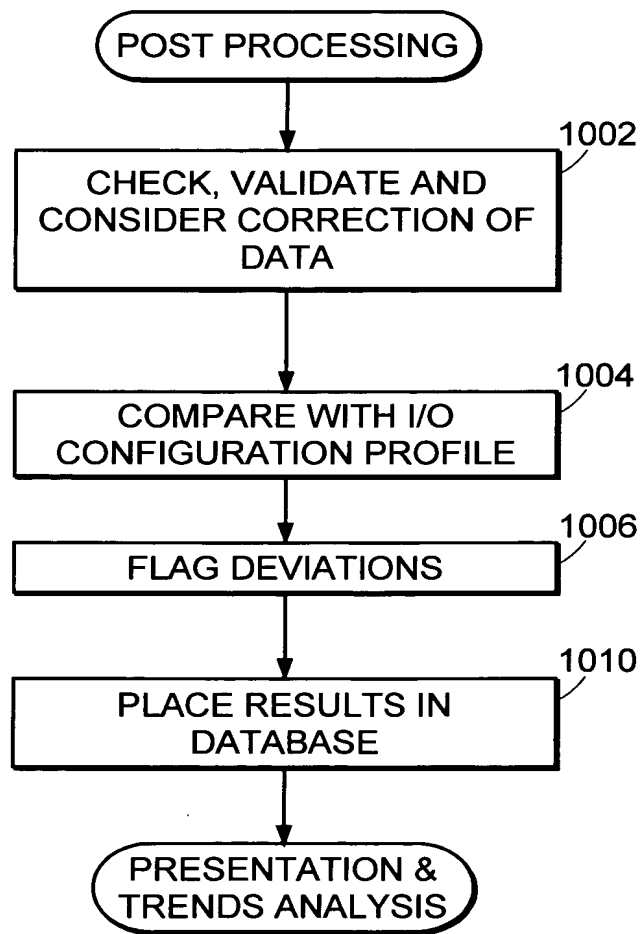


FIG. 10



FILE DESCRIPTIONS

FILE NAME	DESCRIPTION	HIGHLIGHTS
Char.Summary	SUMMARY FILE OF EACH CHARACTERIZATION TEST BROKEN DOWN BY ITERATION, TEST TYPE, AND CONFIGURATION	
Char.Splus	DATA FILE FEED TO Splus TO CREATE CHARACTERIZATION OBJECTS	
Char.Errors	CHARACTERIZATION ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES.	MESSAGE APPEARS IF ERROR FILE EXISTS
SX.Summary	SX SUMMARY DATA BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION	
SX.Splus	DATA FILE FEED TO Splus: USED WITH Char.Summary FILE TO CREATE CHARACTERIZATION OBJECTS	
SX.Errors	SX ERRORS FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS

FIG. 11A

DB.Table	SUMMARY FILE OF EACH DB SIMULATOR TEST BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION		
DB.Splus	DATA FILE FEED TO Splus TO CREATE DBSimulator OBJECTS		
DB.Errors	DB SIMULATOR ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS	
SX_DB.Summary	SX DB SUMMARY DATA BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION		
SX_DB.Splus	DATA FILE FEED TO Splus. USED WITH DB.Splus FILE TO CREATE DBSimulator OBJECTS		
SX_DB.Errors	SX_DB ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS	
Cache Ratio Report	REPORT TRACKING THE CACHE RATIO FROM THE SYM AND THE PROCESSED DATA	REPORT NAME: "CacheRatioReport.txt" LOCATED IN THE RAW DATA FOLDER MESSAGE APPEARS IF A REPORT	

FIG. 11B

1208

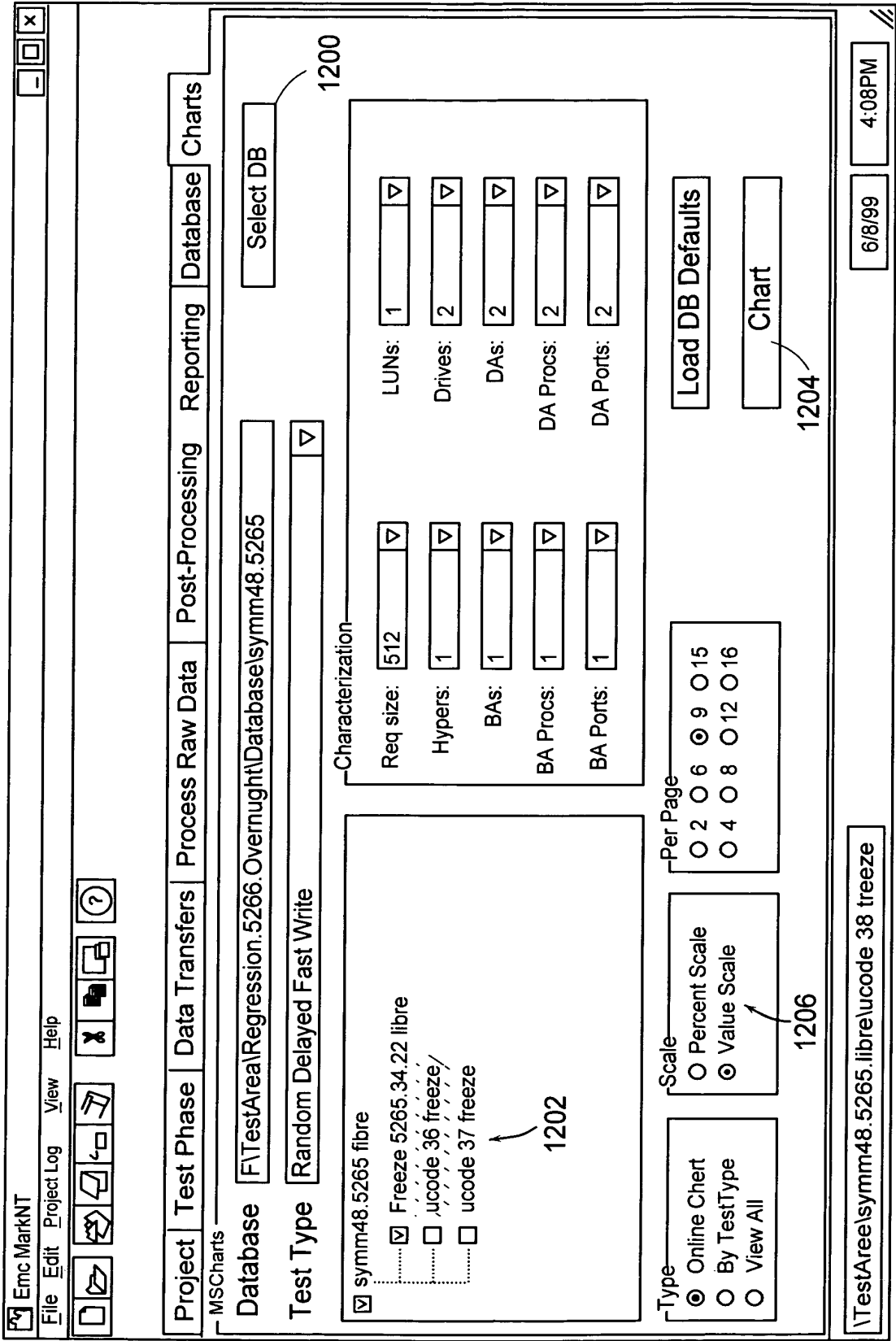


FIG. 12